

OPINION POLL

which technical innovations will be realized by year 2000?

IN THEIR BOOK, "The Year 2000," Herman Kahn and Anthony J. Wiener present a list of technical innovations that will be very likely, less likely, or unlikely to occur during the last third of the twentieth century.

The editors of *Industrial Research* would like to obtain your opinions concerning these proposed innovations—your estimates of when, if ever, you expect them to become realities.

The 98 possible technical innovations listed below were abstracted from the Kahn and Wiener compilation of 135 items. Adjacent to each innovation is a rating scale that you can use to indicate your opinion of the time period during which each innovation will be realized.

We would like to thank McMillan Co. for permission to abstract the list of innovations. A review of the book, "The Year 2000," appears in the "Books & Reports" column in this issue.

1. More reliable and longer-range weather forecasting.
2. Intensive and/or extensive expansion of tropical agriculture and forestry.
3. New methods of water transportation (such as large submarines, flexible and special purpose "container ships").
4. Major reduction in hereditary and congenital defects.
5. Extensive use of cyborg techniques (mechanical aids or substitutes for human organs, senses, limbs, or other components).
6. New techniques for preserving or improving the environment.
7. Relatively effective appetite and weight control.
8. New techniques and institutions for adult education.
9. New and useful plant and animal species.
10. Controlled and/or supereffective relaxation and sleep.
11. New or improved uses of the oceans (mining, extraction of minerals, controlled "farming," source of energy, and the like).
12. Three-dimensional photography, illustrations, movies, and television.
13. Automated or more mechanized housekeeping and home maintenance.
14. Extensive and intensive centralization of current and past personal and business information in high-speed data processors.
15. Other new and possibly pervasive techniques for surveillance, monitoring, and control of individuals and organizations.
16. Some control of weather and/or climate.
17. Other (permanent or temporary) changes—or experiments—with the overall environment.
18. Use of direct electronic communication with and stimulation of the brain.
19. Human hibernation for relatively extensive periods (months to years).
20. Cheap and widely available central war weapons and weapon systems.
21. New and relatively effective counterinsurgency techniques.
22. New techniques for very cheap, convenient, and reliable birth control.
23. New, more varied, and more reliable drugs for control of fatigue, relaxation, alertness, mood, personality, perceptions, fantasies, and other psychological states.
24. Capability to choose the sex of unborn children.
25. Improved capability to "change" sex of children and/or adults.
26. Other genetic control and/or influence over "basic constitution."
27. New techniques and institutions for the education of children.
28. General and substantial increase in life expectancy, postponement of aging, and limited rejuvenation.
29. Generally acceptable and competitive synthetic foods and beverages.
30. "High quality" medical care for undeveloped areas (e.g., use of medical aides and technicians, referral hospitals, broad spectrum antibiotics, and artificial blood plasma).
31. Design and extensive use of responsive and supercontrolled environments for private and public use.
32. Physically nonharmful methods of overindulging.
33. Simple techniques for extensive and "permanent" cosmetological changes (features, "figures," perhaps even skin color, and physique).
34. More extensive use of transplantation of human organs.
35. Permanent manned satellite and lunar installations—interplanetary travel.
36. Permanent inhabited undersea installations and perhaps even colonies.
37. Automated grocery and department stores.
38. Extensive use of robots and machines "slaved" to humans.
39. New uses of underground "tunnels" for private and public transportation.

Please check the box corresponding to the time period during which you feel the adjacent technical innovation will occur.

After completing this month's questionnaire, cut out on rule and enclose it (together with any product inquiry cards) in the postage-paid envelope provided by Industrial Research in this issue. ■

	Prior to 1975	Between 1975 and 2000	After 2000	Never
1.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
8.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
10.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
13.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
16.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
17.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
18.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
19.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
20.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
21.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
24.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
25.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
26.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
27.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
29.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
31.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
32.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
33.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
34.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
36.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
37.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
38.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
39.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Prior to 1975 Between 1975 and 2000 After 2000 Never

	Prior to 1975	Between 1975 and 2000	After 2000	Never
40.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
41.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
42.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
43.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
44.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
45.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
46.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
47.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
48.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
49.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
50.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
53.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
54.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
55.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
56.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
57.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
58.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
59.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
60.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
61.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
62.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
63.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
64.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
65.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
66.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
67.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
68.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
69.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
70.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
71.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
72.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
73.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
74.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
75.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
76.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
77.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
78.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
79.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
80.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
81.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
82.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
83.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
84.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
85.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
86.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
87.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
88.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
89.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
90.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
91.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
92.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
93.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
94.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
95.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
96.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
97.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
98.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

40. Banking systems.
41. Chemical methods for improving memory and learning.
42. Improved chemical control of mental illness and senility.
43. Mechanical and chemical methods for improving human analytical ability more or less directly.
44. New techniques for keeping physically fit and/or acquiring physical skills.
45. Recoverable boosters for economic space launching.
46. Individual flying platforms.
47. Simple inexpensive home video recording and playing.
48. Inexpensive high-capacity, worldwide, regional, and local (home and business) communication.
49. Practical home and business use of "wired" video communication for both telephone and TV and rapid transmission and reception of facsimiles.
50. Shared time computers generally available to home and business.
51. Other widespread use of computers for intellectual and professional assistance (translation, teaching, literature search, medical diagnosis, traffic control, crime detection, computation, design, analysis and to some degree as intellectual collaborator generally).
52. Very low-cost buildings for home and business use.
53. Personal "pagers" (perhaps even two-way pocket phones) and other personal electronic equipment for communication.
54. Direct broadcasts from satellites to home receivers.
55. Inexpensive (less than \$20), long lasting, very small TV receivers.
56. Home computers to "run" household.
57. Home education via video and computerized and programmed learning.
58. Stimulated and planned and perhaps programmed dreams.
59. Inexpensive (less than one cent a page), rapid high-quality black and white reproduction; followed by color and high-detailed photography.
60. Conference TV (both closed circuit and public communication systems).
61. Flexible penology without necessarily using prisons.
62. Common use of individual power sources.
63. Inexpensive worldwide transportation of humans and cargo.
64. Inexpensive road-free (and facility-free) transportation.
65. New methods for rapid language teaching.
66. Extensive genetic control for plants and animals.
67. New biological and chemical methods to identify, trace, incapacitate, or annoy people for police and military uses.
68. Artificial moons and other methods for lighting large areas at night.
69. Extensive use of "biological processes" in the extraction and processing of minerals.
70. "True" artificial intelligence.
71. Practical use of sustained fusion to produce neutrons and/or energy.
72. Artificial growth of new limbs and organs (in situ or transplantable).
73. Room temperature superconductors.
74. Major use of rockets for commercial or private transportation.
75. Effective chemical or biological treatment for most mental illnesses.
76. Almost complete control of marginal changes in heredity.
77. Suspended animation (for years or centuries).
78. Practical materials with nearly "theoretical limit" strength.
79. Conversion of mammals (humans?) to fluid breathers.
80. Direct input into human memory banks.
81. Direct augmentation of human mental capacity by the mechanical or electrical interconnection of the brain with a computer.
82. Major rejuvenation and/or significant extension of vigor and life span—say 100 to 150 years.
83. Chemical or biological control of character or intelligence.
84. Automated highways.
85. Extensive use of moving sidewalks for local transportation.
86. Modification of the solar system.
87. Practical laboratory conception and nurturing of animal (human?) foetuses.
88. A technological equivalent of telepathy.
89. Some direct control of individual thought processes.
90. Life expectancy extended to more than 150 years (immortality?).
91. Almost complete genetic control (but still homo sapiens).
92. Major modification of human species (no longer homo sapiens).
93. Antigravity (or practical use of gravity waves).
94. Interstellar travel.
95. Practical and routine use of extrasensory phenomena.
96. Laboratory creation of artificial live plants and animals.
97. Lifetime immunization against practically all diseases.
98. Substantial lunar or planetary bases or colonies.

2 11 3 15
3 24 51 20